N° 2535 A.D. 1895

Date of Application, 5th Feb., 1895—Accepted, 5th Feb., 1896

COMPLETE SPECIFICATION.

Improvements in Dental Burrs, and in Hand-pieces therefor.

I, John Dietrich Wilkens, of No. 2231 Prairie Avenue Chicago, in the County of Cook and State of Illinois, United States of America, Mechanical Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

My invention relates to certain improvements in hand pieces and burrs for dental engines; and it consists in certain features of construction of those parts of the hand piece which are manipulated to lock and release the tool; and in certain features of construction of the tool, *i.e.*, a dental burr.

In the accompanying drawing,

Figure 1 is a view of the hand piece complete.

Figure 2 is a sectional view, partly in elevation, showing the tool in position to be withdrawn.

Figure 3 is a view showing separately and detached the chuck, the chuck actuating rod and the rear section of a divided spindle.

Figure 4 is a perspective view, partly broken away, of the forward section of the divided spindle.

Figure 5 is a perspective view of a cam lever.

Figure 6 is a similar view of an actuating collar for the cam lever.

Figure 7 is a sectional elevation of the connected ends of the spindle sections and the sliding collar for actuating the cam lever, the latter showing in side elevation.

Figure 8 is a detail plan view of the outside casing.

Figure 9 is a similar view of a sliding sleeve which works over the casing.

Figure 10 shown in inverted plan and side elevation, respectively, a removable detent used in connection with the sliding sleeve.

Figure 11 is a perspective view of an eight toothed burr, showing the stem partially broken away.

Figure 12 is an end view of the head or working end of the burr shown in Figure 11.

Figure 13 shows a six toothed burr; and

Figure 14 a twelve toothed burr, both of which embody my invention.

The hand piece shown in the accompanying drawings belongs to that class wherein a tool driving spindle is revolubly mounted within a non-rotating casing or sheath, the spindle being adapted for connection at its rear end to a flexible shaft or other means for rotating it.

In the drawing, A represents an enclosing casing having the usual hard metal nose piece *a* and an aperture a^1 in the wall of the casing toward its rear end. C represents a sheath collet having threaded ends *c*, one of which threaded ends engages with the internal threads of the casing A, and the other of which engages with a coupling section (not shown). Within the collet C is an internal spindle collet D, having a jamb nut *d*.

E, (Figure 3), represents the rear section of a divided spindle which has its forward end externally threaded for engagement with the front spindle section F, (Figure 4). The spindle section E is longitudinally slotted, as at *e*, Figures 2, 3 and 7, and this slot is bisected by a transverse depression e^1, which forms a seat for

[*Price 8d.*]

the lugs of the cam lever G. This cam lever has a straight front face ; its lower side is curved ; and the tail piece of the lever extends to about the plane of the lugs *g*, which is coincident with that of the opening of the slot *e*. When the lugs *g* rest in their seats, the cam lever is suspended thereby, its body resting within the slot *e* and the tail piece projecting into the path of travel of an internal rib *h* of a collar H, which collar encircles and slides upon the spindle section E, the rib riding in the slot *e* of the spindle.

I represents a chuck operating rod which is slidably mounted in the front section F of the divided spindle ; and J represents a tubular chuck having its front end split to provide the spring clamping jaws *j*. The chuck jaws are closed by their impingement upon the internal tapering walls of the front end of the spindle section F, and by their closing they are made to gripe the shank of a tool, as K. The collar H is actuated by means of a sliding sleeve L, which is mounted over the aperture a^1 in the sheath or casing A. This sliding collar has a longitudinal depression *l*, the bottom wall of which is cut away at one point l^1. The front or end wall of the depression is under-cut or dove-tailed, as at l^{11}. Mounted within the seat formed by this depression is the detent M, shown in Figure 10, and consisting of a flat plate having its forward end dove-tailed or bevelled to correspond with the under-cut or dove-tailed front wall of the seat, as shown in the side elevation Figure 10, at *m*, while the rear end of the detent is preferably cut away or notched, as shown at m^1. On the lower side of this plate M is the lug M^1, which projects through the aperture l^1 and engages a groove h^1 in the collar H. A locking collar N has a threaded engagement with the collar L and engages also the offset m^1 of the detent M, thus preventing the latter leaving its seat.

The operation of the parts will now be understood. When the several parts are in the position shown in Figure 2, the tool K may have its shank entered between the chuck jaws and then to lock the tool the sliding collar will be drawn back, the lug of its detent moving correspondingly and in the same direction the sliding collar H whose lug *h* will engage the tail piece of the cam lever G, thrusting the lower front corner of the latter into engagement with the sliding actuating rod I, which in turn moves the chuck forward within the front section of the spindle, closing the chuck jaws and gripping the tool.

To release the tool, the sleeve is slipped forward, freeing the cam lever and the actuating rod I and chuck J, and as soon as the pressure upon the latter is relieved the tool may be easily withdrawn.

Many of the features of construction are intended to facilitate and economize manufacture, while the particular construction is such that the various parts may be readily assembled and securely held in position so as to attain certainty of operation and prevent any undue wear or movement of the parts with relation to each other. The principal feature of the invention, however, relates to the manner of locking and releasing the tool. Where the operator desires a hand piece in which the tools can be rapidly changed, the sliding sleeve furnishes the most expeditious and least objectionable form of device for effecting the locking and releasing of the tool ; and in my construction the actuating collar and cam lever are mounted upon and rotate with the spindle, while the sliding sleeve is mounted upon the casing and is not rotatable. Furthermore, the sliding sleeve is always maintained in operative position with relation to the sliding collar which acts upon the cam lever so that no matter in what position the collar and cam lever may be they are actuated by the sliding of the external sleeve in its groove.. The detent, which forms the connection between the sliding sleeve and the sliding collar, is removable to permit ready assembling of the parts, and the dove-tailed connection of the detent with the seat in the sleeve, in conjunction with the locking collar, affords efficient means for retaining the detent in its place during operation and yet permits its ready removal or insertion.

A hand piece constructed as above described has no parts which are subject to much wear ; but in order to compensate for any wear that may result, I provide the spindle collet D with the milled head D^1 so that by screwing the collet D forward in the sheath collet C compensation for wear is secured.

While I have shown the spindle as divided or constructed in two sections, I do not limit my invention thereto, as it is obvious that this feature is structural only and not of the essence of the invention.

The burr is so constructed as to provide at its apex suitable cutting edges, preferably continuous with the cutting edges of the leaves or teeth extending over the sides or body of the head of the tool, and alternating with teeth whose cutting edges terminate short of the apex.

In the most common construction of these tools, there has been provided a series of cutting blades whose cutting edges are arranged in spiral lines converging to the axis of rotation of the tool and forming whorls circumferentially of the head. These cutting blades usually terminate at the extremity of the head at a point coincident with the axis of rotation, and usually a channel or groove has been cut across the point of the tool at right angles to its axis of rotation. This construction is objectionable for the reason that the chips of tooth matter accumulate in such channel or depression and thus clog the tool, create friction and impede and render more painful the operation.

To remedy this defect it has been proposed to provide a burr-drill, as the inventor calls it, having a single continuous cutting edge crossing the axis of rotation of the tool, the theory of the inventor being that the presence of this cutting edge would adapt the tool for use both as a drill and as a burr, and render it equally adapted for cutting in the line of its axis as at right angles thereto.

There are certain advantages and disadvantages incident to both of these earlier forms of construction. In the first described construction, *i.e.*, where the cutting blades or leaves all terminate near the axial centre, there is no effective cutting edge at such point, and therefore the channel is usually cut to provide a clearance, and the burr or drill clogs as before described. On the other hand, this construction has certain advantages in that the cutting edge is extended and is effective to a point very near the axial centre of the head, so that side or lateral cutting as well as cutting in the line of the axis is facilitated.

In the construction wherein a single cutting edge has been extended across the axis of rotation of the drill, the side leaves or teeth have been grouped on opposite sides of the head with the cutting edges of each terminating at a single point at some distance from such central cutting edge. This leaves spaces between such points and the cutting edge crossing the apex of the head which are not operated upon by the side cutting leaves. It is desirable to space these cutting edges as near together as practicable with due regard to clearance of the chips and tooth matter; and my improvement consists in a burr having teeth or leaves provided with cutting edges extending across the axis of rotation of the drill and bisecting each other at said axis, and alternating or intermediate leaves having their cutting edges terminating sufficiently short of the axis to provide for suitable clearance for the material removed by cutting edges which cross the axis of the burr.

In the tool shown in Figures 11 and 12, there are eight leaves or teeth, as they are commonly called in the art, and the leaves o and o^1 are connected by a single continuous cutting edge extending across the axis of rotation of the tool. The leaves p and p^1 are similarly connected, the connecting cutting edge of the leaves o, o^1 and p, p^1, bisecting each other at the axis of rotation. Alternating with these are the intermediate leaves or teeth q of substantially the same contour as the connected leaves or teeth, but their cutting edges terminate short of the axial centre of the tool, thus providing for clearance, as indicated at r.

The number of leaves or teeth vary considerably. In constructing small burrs, frequently only six teeth are employed as shown in Figure 13, and in this case, instead of having two pairs of leaves connected by continuous cutting edges intersecting each other, three of the leaves have their cutting edges extended across the end of the head while the intermediate leaves have their cutting edges terminating short of the apex. In Figure 14 I have shown a burr having twelve teeth six of which are connected in pairs by cutting edges crossing the apex and alternated with disconnected teeth or leaves whose cutting edges terminate short of the axis.

From the above description it will be seen that there is no "dead" point upon the working end of this tool, as in the construction where the leaves are grouped and terminate at the same point. The cutting edges which bisect each other at the axis of rotation of the tool completely traverse all of the surface not touched by the edges of the main body of the leaves, while the independent or disconnected leaves *q* have their cutting edges extended sufficiently near to the axis of rotation to assist materially in the cutting without liability of clogging the head of the tool with tooth matter.

It will be seen that a leaf *q* is interposed between each pair of the connected leaves and has an independent cutting edge, and this will be much more effective than that wherein the cutting edges all terminate at or near the axis of the drill, and also more effective than the construction wherein three or more of the side leaves are converged to a single point and with a single cutting edge only extending across the head of the drill.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is :—

1. In a dental hand piece, the combination with an outer casing or sheath having a longitudinal working aperture in its wall, a rotatable hollow spindle mounted therein and having a longitudinal slot, an endwise movable chuck within the hollow of the spindle, a cam lever pivotally mounted in the spindle slot and rotatable therewith, a collar sliding on the spindle and having a rib or projection to engage and positively rock the cam lever, and a sliding sleeve mounted on the casing and having a detent movable in the working aperture thereof and adapted to engage and move the sliding collar, substantially as described.

2. In a dental engine hand piece, the combination with a casing, a sliding sleeve mounted thereon, a detent working in a slotted aperture of the casing, a sectional spindle whose front section is hollow and rear section slotted, and the two sections being threaded for engagement with each other, a cam lever pivoted in the slot of the rear section, a sliding chuck and a chuck actuating rod within the hollow of the front spindle section, the heel of the cam being adapted to operate upon the actuating rod, a sliding collar on the spindle, said collar having an internal rib working in the groove or slot thereof and engaging the lever and said collar having a peripheral groove with which the detent of the sliding sleeve engages, substantially as described.

3. In a dental engine hand piece, a lock operating device comprising a sliding sleeve having a removable detent provided with a lug adapted to work through an aperture of the casing, said sleeve having a seat or depression to receive the body of the detent and an aperture to permit the passage of its lug, the front wall of the seat being under-cut or dove-tailed and the front end of the detent being bevelled, and a locking collar having threaded engagement with the sliding sleeve and adapted to engage the rear end of the detent to secure it in place, substantially as described.

4. A dental burr having leaves connected by a continuous cutting edge crossing the axis of rotation of the burr and one or more leaves having a cutting edge extending to said axial centre at an angle to the cutting edge of the pair and other leaves having cutting edges terminating short of the axial centre arranged intermediate the connected leaves, substantially as described.

5. A dental burr having leaves connected in pairs to provide a plurality of continuous cutting edges crossing the axis of rotation and intersecting each other at

said axis, and intermediate leaves alternating with the connected leaves, said intermediate leaves having cutting edges terminating short of the axis of rotation, substantially as described.

Dated the 5th day of February 1895.

HASELTINE, LAKE & Co.,
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London: Printed for Her Majesty's Stationery Office, by Darling & Son, Ltd.—1896

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WILKENS' Complete Specification.

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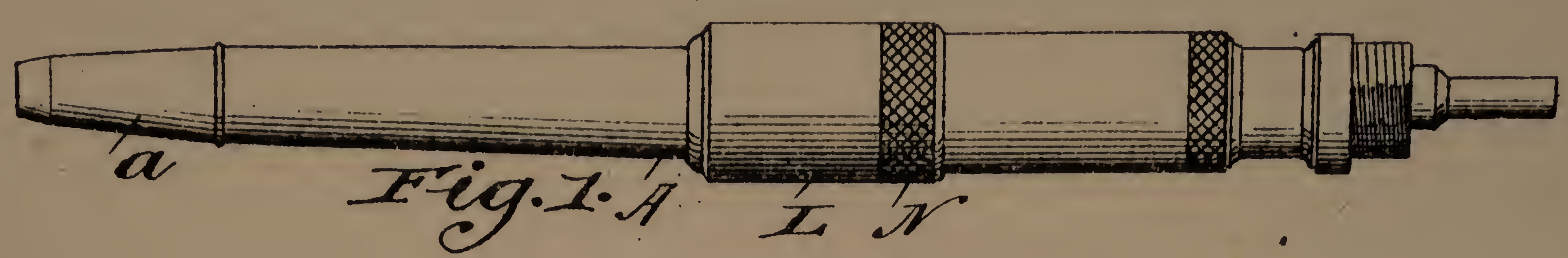


Fig. 2.

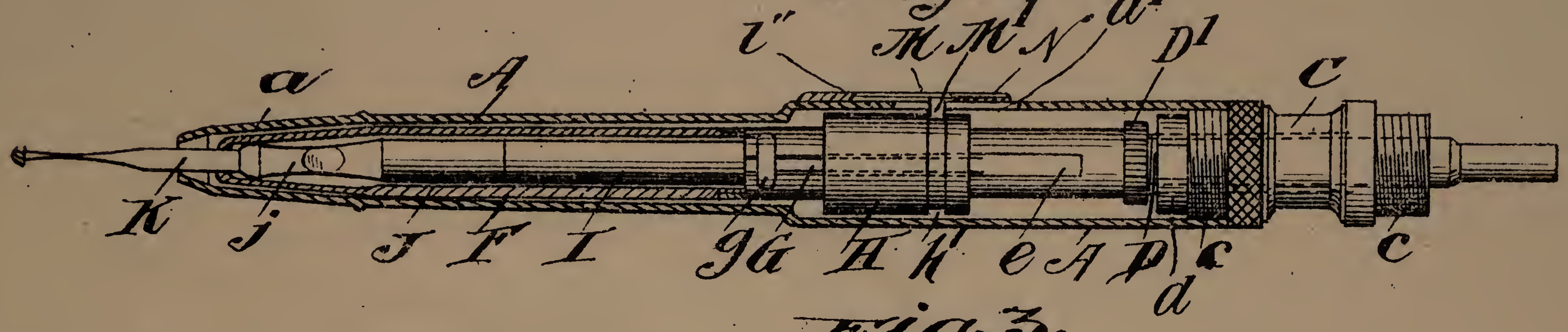
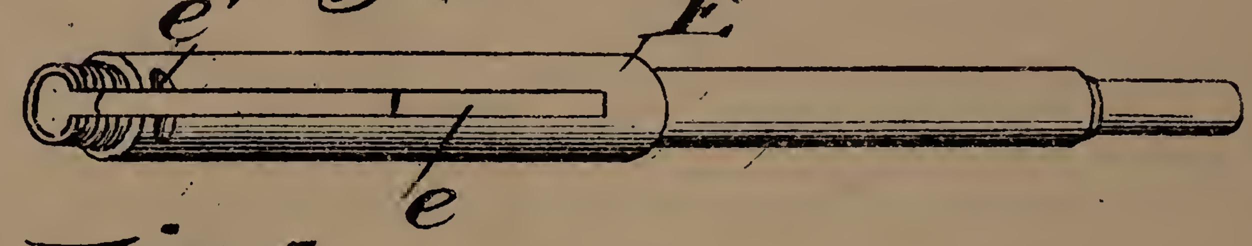


Fig. 3.



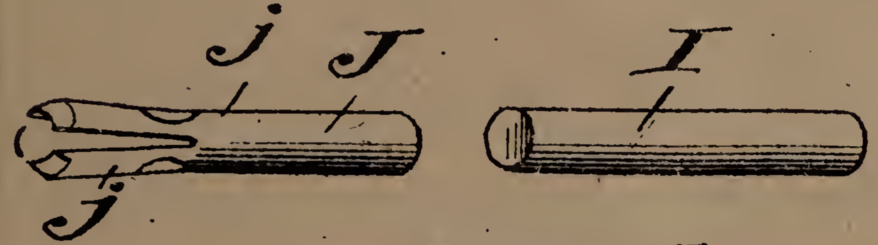


Fig. 4.

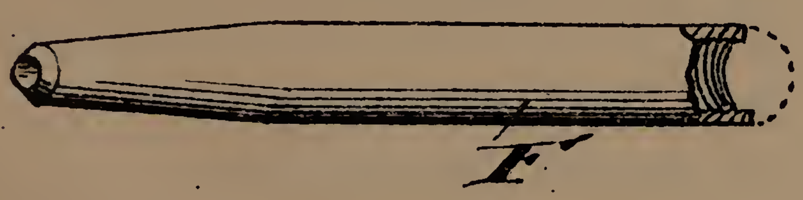
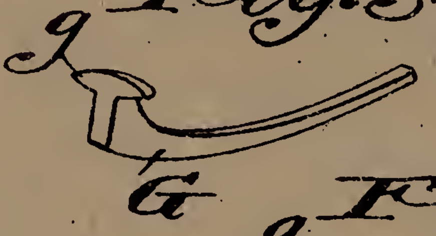


Fig. 5.



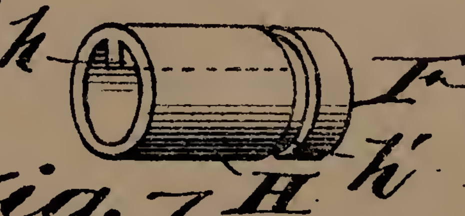


Fig. 6.

Fig. 7.

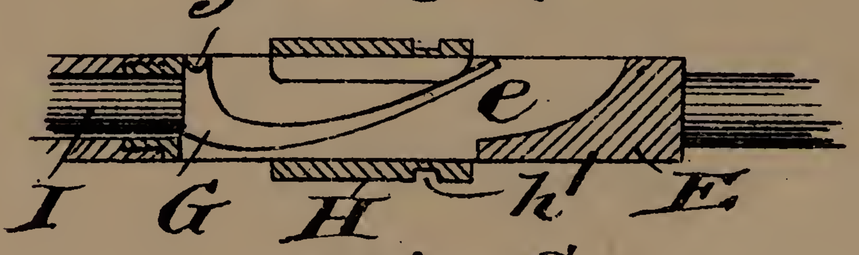


Fig. 8.

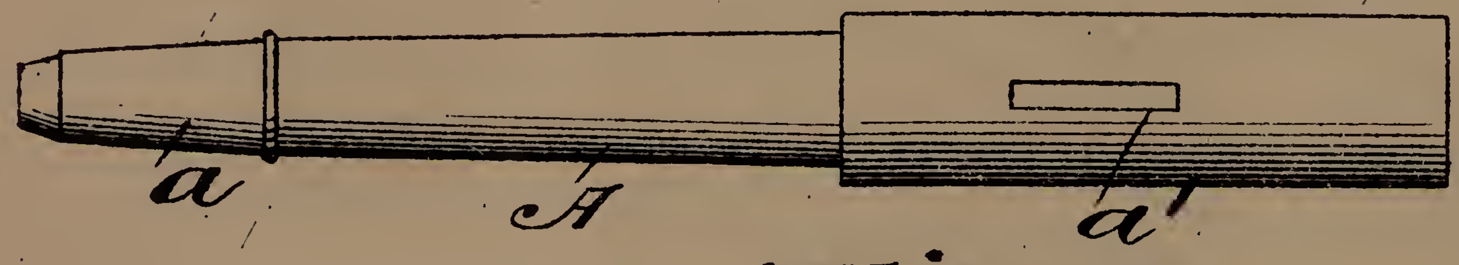


Fig. 10.

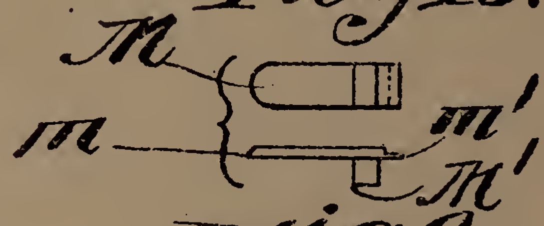


Fig. 9.

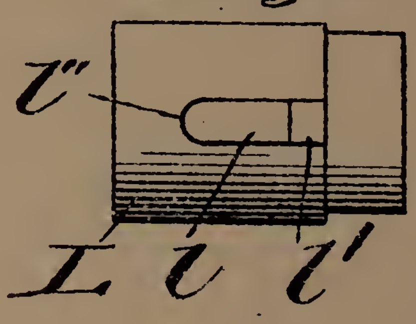


Fig. 12.

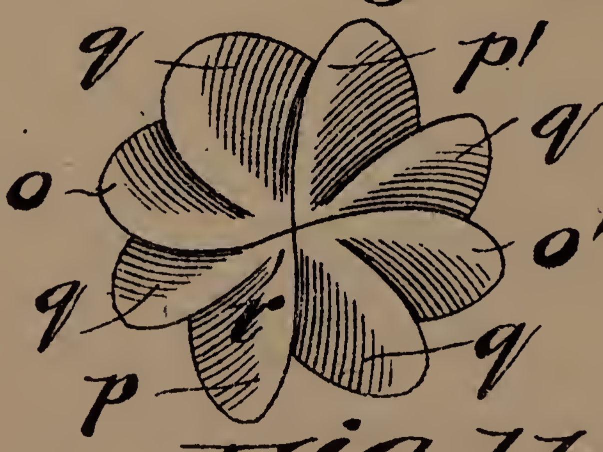


Fig. 11.

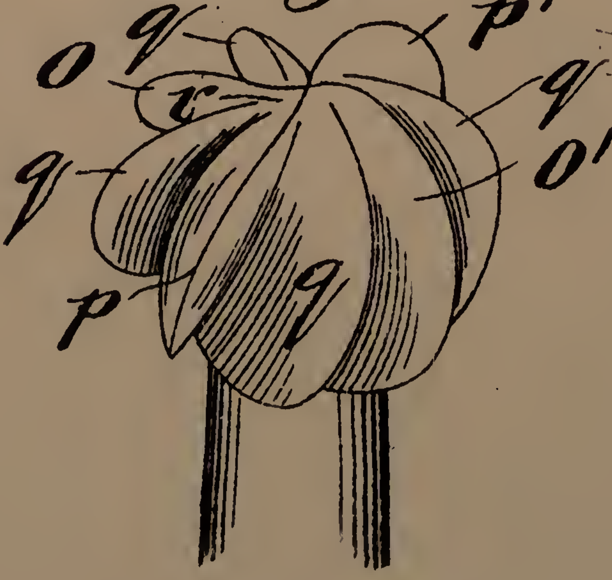


Fig. 13.

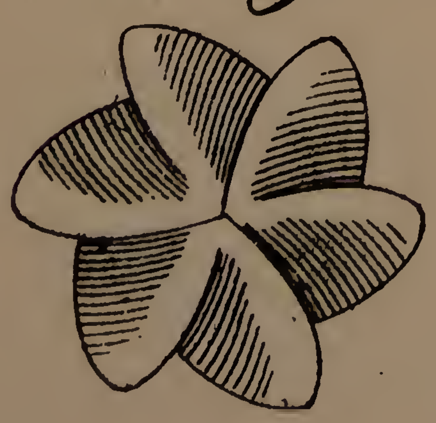
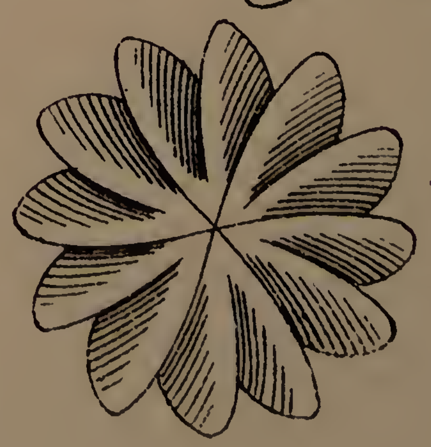


Fig. 14.



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